

DETAILED ACTION

Information Disclosure Statement

1. Applicant's arguments are persuasive. Specifically, the WO 99/02586 and JP 6-25446 have been considered since the non-submitted JP 6-25446 corresponds to submitted EP 0 559 437 and the non-submitted WO 99/02586 corresponds to U.S. Patent 6,429,157. In view of the newly filed information disclosure statement Document JP-2767329 has been considered.

Claim Rejections - 35 USC § 112

2. In view of the amendment to claim 8, the rejection under 112, 2nd paragraph for being indefinite has been withdrawn. However, upon further consideration, a new rejection has been made in view of previously applied prior art.

Response to Arguments

3. Claims 9-14 and 17-20 have been cancelled. In view of the amendment to the claims, the rejection of claims 9-14, 17-20, 24, and 25 under 35 U.S.C. 102(b) as being anticipated by Ozaki et al. (US 6,027,794) is withdrawn.
4. Applicant argues all of the cited references fail to disclose any examples having the claimed combination of features mentioned above and recited in the present claims.

Examiner notes that “The use of patents as references is not limited to what the patentees describe as their own inventions or to the problems with which they are concerned. They are part of the literature of the art, relevant for all they contain.” *In re Heck*, 699 F.2d 1331, 1332-33, 216 USPQ 1038, 1039 (Fed. Cir. 1983) (quoting *In re Lemelson*, 397 F.2d 1006, 1009, 158 USPQ 275, 277 (CCPA 1968)). Further, a reference may be relied upon for all that it would have reasonably suggested to one having ordinary skill the art. (See *Merck & Co. v. Biocraft Laboratories*, 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir.), cert. denied, 493 U.S. 975 (1989). Therefore, the references are not limited by their examples.

5. Applicant argues Kishi '437 fails to disclose a resin composition which additionally includes an oxazolidinone ring-containing epoxy resin as in the present invention. Sugimori '006 fails to disclose a resin composition that contains a solid rubber component as in the present invention. Sugimori '006 further fails to disclose any resin composition examples that include a glycidylamine type epoxy resin component as required by the present invention. Sugimori '006 fails to disclose or suggest any advantageous properties associated with the combination of a glycidylamine type epoxy resin component in combination with the other components of the present invention as recited in the present claims. Although, a glycidylamine type epoxy resin component is mentioned as one possible optional component (E) in Sugimori '006, it is not preferred and is not found in any of the disclosed examples so as to suggest to one skilled in the art that it is one of a wide variety of possible selections without any suggestion that it could

be used to improve any properties. In addition, there fails to be an adequate basis to combine Sugimori '006 with Kishi '437, since there fails to be any adequate explanation as to why one skilled in the art would selectively combine components from each of the disclosed compositions, while ignoring the fact that Sugimori '006 employs no solid rubber, whereas Kishi '437 requires such a component.

Examiner is not persuaded. In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, Kishi et al. and Sugimori et al. are both directed to curable epoxy resins for use in fiber-reinforced composite materials. As such, the choice and combinations of resins as taught by the combined prior art would have been well within the ordinary skill of one in the art at the time of the invention in order to tailor the properties of the epoxy resins for their use in structural materials of airplanes as recognized by both pieces of art. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

6. Applicant argues Kouchi '206/' 882 fails to disclose a resin composition which includes a solid rubber component as in the present invention. It appears that an attempt to employ a solid rubber in the composition of Kouchi '206/'882 would be inconsistent with the stated objective of improving elastic modulus (see paragraph [0015]), since, as is well known in the art, the addition of rubber to such compositions will generally lower the elastic modulus properties. Although Kouchi '206/' 882 discloses the possibility of using an oxazolidinone ring-containing epoxy resin, no examples of the combination of this component with a glycidylamine type epoxy resin are disclosed.

Examiner is not persuaded and maintains the position as set forth above regarding the reference examples. Kouchi discloses an epoxy resin to be used for production of the epoxy resin composition may be a mixture containing an epoxy resin that is solid at room temperature, but the mixture itself should be liquid at room temperature. (See [0085]) As such examiner notes that Kouchi et al. clearly suggest that a solid epoxy resin may be utilized when producing a final epoxy resin composition from a mixture. Kishi et al. discloses a matrix resin composition comprising an epoxy resin which may be a mixture of two or more epoxy resins. (See pg. 4, lines 6-8) Kishi et al. also discloses acrylonitrile-butadiene is the preferred rubber of the matrix resin composition. (See pg. 4, lines 48-51 and pg. 5, lines 20-23) Therefore, it would have been obvious to one of ordinary skill in the art motivated by expected success to utilize the acrylonitrile-butadiene rubber as taught by Kishi et al. in the composition as disclosed by Kouchi et al.

for the added benefit of providing high viscosity and high thixotropic properties. (See pg.4, lines 45-46) Additionally, a *prima facie* case of obviousness exists for one of ordinary skill in the art to substitute one epoxy resin for another in order to form a mixture of epoxy resins outside the showing of unexpected results.

7. Applicant argues Both Ozaki '794 and Zhou '052 are cited in support of rejections as noted above. However, both of these references fail to disclose or suggest the use of element [C], i.e. a thermoplastic resin having openings and a continuous form as recited in claim 22, for example. Further, these references fail to disclose or suggest the resin composition of the present invention as recited in claim 1 from which claims 24 and 25 have been amended to depend.

Examiner is not persuaded and maintains the position as set forth above regarding the piecemeal analysis of the references individually. It is noted by examiner that applicant discloses that the element [C] as claimed means a thermoplastic fabric such as a nonwoven. (See [0064] instant specification) Ozaki et al. the component [C] is made from long fibers of a thermoplastic resin and is distributed at random near the surface layer of the prepreg. The random distribution can also be realized by using a long-fiber nonwoven fabric. (See Col 8, lines 47-49 and 58-59) Therefore, the limitation is taught by the prior art.

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

10. Claims 1-3 and 5-7 are rejected under 35 U.S.C. 103(a) as being obvious over Kishi et al. (EP 0559437) in view of Sugimori et al. (US 6,670,006).

Regarding claims 1 and 3, Kishi et al. discloses a resin composition including an epoxy resin, a curing agent and a rubber (preferably solid). (See pg. 3, lines 16-17) Kishi et al. discloses the epoxy resin may contain a glycidylamine type epoxy resin such as tetraglycidyl diaminodiphenylmethane. (See pg. 3, lines 53-56) Kishi et al. discloses the epoxy resin may be a mixture of two or more epoxy resins. (See pg. 4, lines 6-8) Kishi et al. discloses an aromatic diamine may be used as the curing agent. (See pg. 4, lines 25-26) Kishi et al. discloses acrylonitrile-butadiene is the preferred rubber and may be 3-12 parts by weight in 100 parts by weight of the matrix resin composition. (See pg. 4, lines

48-51 and pg. 5, lines 20-23) Kishi et al. discloses the resin composition is used for a cured composite. (See Abstract) Kishi et al. discloses all of the claim limitations as set forth above, but the reference is silent as to an epoxy resin having oxazolidone rings and a glass transition temperature of 160 to 220°C after heat curing at 180°C for 2 hours.

Sugimori et al. discloses an epoxy resin composition comprising an epoxy resin having oxazolidone rings (component B), and a curing agent (component C). (See Abstract) Sugimori et al. discloses the epoxy resin having oxazolidone rings is essential for high crushing strength. (See Col 4, lines 12-14) Sugimori et al. discloses the curing agent may be an amine compound. (See Col 5, lines 27-30) Sugimori et al. further discloses the composition may contain a component E selected from a glycidylamine-type resin.

As Kishi et al. and Sugimori et al. are both directed to curable epoxy resins, the art is analogous. Therefore, it would have been obvious to one of ordinary skill in the art motivated by expected success to utilize the epoxy resin having oxazolidone rings as taught by Sugimori in the composition as disclosed by Kishi et al. since the Kishi reference discloses that a mixture of two or more epoxy resins may be used. It is noted by examiner that the composition of Sugimori et al. would have been well known in the art at the time of applicant's invention and therefore one of ordinary skill in the art would have been easily motivated to improve the crushing strength of the final Kishi resin for end use by utilizing an additional epoxy resin having oxazolidone rings. (See Col 4, lines 12-14)

As the composition of modified Kishi et al. has been shown to be substantially similar in component make-up as that claimed by applicant, examiner has reason to believe that the glass transition temperature of 160 to 220°C after heat curing at 180°C for 2 hours would have been a result effective variable. It is noted that while Sugimori does not disclose the use of a solid rubber in the epoxy composition, the reference contains examples which provide evidence that the components of the composition would affect the glass transition temperature calculated. This is seen in Table 1 for a composition that comprises only components A, B, C, and E versus glass transition temperature values calculated in Table 5 for a composition comprising components A, B, C, D, and E. Further, it is noted that one of ordinary skill in the art would have been easily motivated to adjust the time and temperature parameters of the curing conditions. Sugimori discloses curing conditions at 130°C for one hour. (See Col 13, lines 1-2) It would have been obvious to one having ordinary skill in the art at the time the invention was made to create curing parameters for obtaining a preferred glass transition temperature since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). In the present invention, one would have been motivated to optimize the curing parameters for obtaining a preferred glass transition temperature with the desire to tailor the final cured product containing the epoxy resin for end use such as for structural components of airplanes, automobiles and the like. (See Kishi pg. 2, lines 9-14).

Further regarding claim 1, Kishi et al. discloses a Bisphenol A type epoxy resin in an amount of 10-60wt% with a tetraglycidylaminodiphenyl methane resin in an amount of 10-40wt%. (See pg. 4, lines 10-20) While Kishi doesn't disclose the oxazodilone ring resin, Sugimori et al. discloses compositions in which the oxazodilone ring resin is present in amounts of 20-70% by weight of the total of the epoxy resin components. (See Table 1, Col 14) Therefore, one of ordinary skill in the art would have been easily motivated to substitute the oxazodilone ring resin as taught by Sugimori et al. for the Bisphenol A type epoxy resin as disclosed by Kishi et al. Further, it would have been obvious to one of ordinary skill in the art at the time the invention was made to optimize the weight percent of each epoxy resin since it has been held that, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation. *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). The burden is upon the Applicant to demonstrate that the claimed weight percent of each epoxy resin is critical and has unexpected results. In the present invention, one would have been motivated to optimize the weight percent of each epoxy resin motivated by the desire to tailor the final cured product containing the epoxy resin for end use such as for structural components of airplanes, automobiles and the like. (See Kishi pg. 2, lines 9-14).

Regarding claim 5 Sugimori et al. further discloses a G_{IC} of 400 J/m² or more is particularly preferable. (See Col 7, lines 9-13 and Table 1)

Regarding claim 6 Sugimori et al. further discloses the epoxy resin composition for a FRP is required to have a viscosity of 100 to 5,000 poises measured by the described method for measuring viscosities. If the viscosity of the epoxy resin composition for the FRP is less than 100 poises at 60°C, the tack becomes too strong or the resin flow at the time of molding becomes too great, making it impossible to obtain the intended properties after the molding, which is unpreferable. Furthermore, if the viscosity of the epoxy resin composition for the FRP is over 5,000 poises, the impregnation with the resin at the time of formation of a prepreg becomes insufficient, the tack is lost to too great an extent, or the prepreg becomes hard, making it impossible to obtain the intended properties after the molding, which is unpreferable. A more preferable range is from 300 to 3,000 poises. (See Col 5, lines 55-68 and Col 6, lines 1-4) Examiner notes that 100 to 5,000 poises is equivalent to 10 to 500 Pa.s which would overlap the range as claimed by applicant. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to optimize the viscosity since it has been held that, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation. *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). The burden is upon the Applicant to demonstrate that the claimed viscosity is critical and has unexpected results. In the present invention, one would have been motivated to optimize the viscosity motivated by the desire to control the tack of the resin to tailor the intended properties after molding. (See Col 5, lines 55-68).

Regarding claim 7, modified Kishi et al. discloses all of the claim limitations as set forth above. Sugimori et al. discloses a prepreg comprising a sheet of reinforcing fibers impregnated with an epoxy resin composition for an FRP. (See Col 2, lines 48-50)

11. Claim 8 is rejected under 35 U.S.C. 103(a) as being obvious over Kishi et al. (EP 0559437) in view of Sugimori et al. (US 6,670,006) and further in view of Oosedo et al. (US 6,063,839)

Regarding claim 8 modified Kishi et al. discloses all of the claim limitations as set forth above, but the reference is silent as to a volatile component in an amount of 0.1 to 1% by weight. Additionally, examiner notes that applicant does not elaborate on the type of volatile component or its function in the instant specification.

Oosedo et al. discloses epoxy resin compositions for fiber-reinforced composite materials. (See Abstract and Col 1, lines 13-19) Oosedo et al. discloses the epoxy resin composition that comprises, as the constitutive element [B], fine particles comprising a rubber phase and insoluble in epoxy resins can give a cured product having heat resistance. (See Col 7, lines 29-35) Oosedo et al. discloses the fine particles added to epoxy resin compositions may contain volatile dispersing media, which must be removed in any step for the production of fiber-reinforced composite materials using the resin compositions. If the removal is unsatisfactorily conducted, the remaining volatile

dispersing media (water and organic solvents) produce voids in the fiber-reinforced composite materials. (See Col 7, lines 50-57)

As modified Kishi et al. and Oosedo et al. are both directed to epoxy resins for fiber-reinforced composite materials, the art is analogous. Therefore, while not preferred by Oosedo et al., it would have been obvious to one of ordinary skill in the art at the time of the invention to utilize a volatile component in the epoxy resin as claimed by modified Kishi motivated by the desire to produce voids in the final composite materials. (See Col 7, lines 50-57)

Further, it is noted that it would have been obvious to one of ordinary skill in the art at the time the invention was made to optimize the amount of volatile substance since it has been held that, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation. *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). The burden is upon the Applicant to demonstrate that the claimed amount of volatile substance is critical and has unexpected results. In the present invention, one would have been motivated to optimize the amount of volatile substance motivated by the desire to tailor the amount and size of the voids for the final composite materials. (See Col 7, lines 50-57). Oosedo et al. discloses fiber-reinforced composite materials comprising, as the intermediate bases, prepgs that comprise reinforcing fibers and matrix resins are widely used not only in

sports goods but also in the aerospace industry and other various general industries. (See Col 1 lines 13-19)

12. Claim 4 is rejected under 35 U.S.C. 103(a) as being obvious over Kishi et al. (EP 0559437) in view of Sugimori et al. (US 6,670,006) as applied to claim 1 and further in view of Kouchi et al. (WO 03/040206)

This rejection is over WO 03/040206 because the reference qualifies as prior art under 102(b). However, for convenience, the column and line numbers of the English language equivalent and national stage entry, US 2004/0247882, will be cited below.

Regarding claim 4 modified Kishi et al. discloses all of the claim limitations as set forth above, but the reference does not specifically disclose wherein the glass transition temperature of the cured material after immersion of the cured material in boiling water for 2 days is in a range from 110 to 150°C.

Kouchi et al. disclose a liquid epoxy resin composition for low cost production of high performance fiber reinforced composite material. (See [0015]) Kouchi et al. disclose preferred epoxy resins comprise di- or higher functionality such as tetraglycidylaminodiphenyl methane and an epoxy resin having oxazolidone rings. (See [0088]-[0089] and [0111]) Kouchi et al. disclose epoxy resin compositions for fiber reinforced composite material to be used in the aerospace industry are required to be

small in the decrease in glass transition temperature caused by water absorption, as well as able to form a cured product with a high glass transition temperature. Accordingly, the epoxy resin composition, after being cured for two hours at 180°C and immersed in boiling water for 48 hours, preferably have a glass transition temperature of 130°C or more. (See [0141]) Kouchi et al. discloses by meeting these requirements, the resulting fiber reinforced composite material comprising a cured product of said epoxy resin composition as a matrix can have a high compressive strength in wet heat. (See [0044])

As modified Kishi et al. and Kouchi et al. are directed to epoxy resin compositions, the art is analogous. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to utilize the curing conditions of Kouchi et al. in place of the conditions as disclosed by modified Kishi et al. in order to provide a cured product having high compressive strength in wet heat which would be favorable for the aerospace industry. (See [0044])

13. Claims 1-4 and 7 are rejected under 35 U.S.C. 103(a) as being obvious over Kouchi et al. (WO 03/040206) in view of Kishi et al. (EP 0559437).

This rejection is over WO 03/040206 because the reference qualifies as prior art under 102(b). However, for convenience, the column and line numbers of the English language equivalent and national stage entry, US 2004/0247882, will be cited below.

Regarding claims 1, 3, 4, Kouchi et al. disclose a liquid epoxy resin composition for low cost production of high performance fiber reinforced composite material. (See [0015])

Kouchi discloses an epoxy resin to be used for production of the epoxy resin composition according to the invention may be a single component material that is liquid at room temperature, but also may be a mixture. Said mixture may contain an epoxy resin that is solid at room temperature, but the mixture itself should be liquid at room temperature.

(See [0085]) Examiner notes the suggestion to utilize a mixture comprising solid epoxy.

Kouchi discloses preferred epoxy resins comprise di- or higher functionality such as tetraglycidylaminodiphenyl methane and an epoxy resin having oxazolidone rings.

(See [0088]-[0089] and [0111]) Said epoxy resin compositions should, after being cured for two hours at 180°C, preferably have a glass transition temperature of 170°C or more.

(See [0040]) Epoxy resin compositions for fiber reinforced composite material to be used in the aerospace industry are required to be small in the decrease in glass transition temperature caused by water absorption, as well as able to form a cured product with a high glass transition temperature. Accordingly, the epoxy resin composition according to the invention should, after being cured for two hours at 180°C and immersed in boiling water for 48 hours, preferably have a glass transition temperature of 130°C or more. (See [0141])

Kouchi et al. discloses by meeting these requirements, the resulting fiber reinforced composite material comprising a cured product of said epoxy resin composition as a matrix can have a high compressive strength in wet heat. (See [0044])
Kouchi discloses all of the claim limitations as set forth above but does not disclose a solid rubber compound.

Kishi et al. discloses a resin composition including an epoxy resin, a curing agent and a rubber (preferably solid). (See pg. 3, lines 16-17) Kishi et al. discloses the epoxy resin may contain a glycidylamine type epoxy resin such as tetraglycidyl diaminodiphenylmethane. (See pg. 3, lines 53-56) Kishi et al. discloses the epoxy resin may be a mixture of two or more epoxy resins. (See pg. 4, lines 6-8) Kishi et al. discloses an aromatic diamine may be used as the curing agent. (See pg. 4, lines 25-26) Kishi et al. discloses acrylonitrile-butadiene is the preferred rubber and may be 3-12 parts by weight in 100 parts by weight of the matrix resin composition. (See pg. 4, lines 48-51 and pg. 5, lines 20-23) Kishi et al. discloses the resin composition is used for a cured composite. (See Abstract) Kishi et al. discloses all of the claim limitations as set forth above, but the reference is silent as to the an epoxy resin having oxazolidone rings and an glass transition temperature of 160 to 220°C after heat curing at 180°C for 2 hours.

As Kouchi et al. and Kishi et al. are both directed to curable epoxy resins, the art is analogous. Therefore, it would have been obvious to one of ordinary skill in the art motivated by expected success to utilize the acrylonitrile-butadiene rubber as taught by Kishi et al. in the composition as disclosed by Kouchi et al. for the added benefit of providing high viscosity and high thixotropic properties. (See pg.4, lines 45-46) Additionally, a *prima facie* case of obviousness exists for one of ordinary skill in the art to substitute one epoxy resin for another in order to form a mixture of epoxy resins outside the showing of unexpected results.

Further regarding claim 1, Kouchi et al. also discloses a way to prevent the glass transition temperature from being decreased by water absorption is to use, as said epoxy resin component with tri- or higher functionality, at least one epoxy resin selected from the group of N,N,N',N'-tetra-glycidyl-4,4'-diaminodiphenylmethane and its alkyl-substituted derivatives, in combination with at least one epoxy resin selected from the group of N,N-diglycidyl aniline and its alkyl-substituted derivatives as said epoxy resin component with di- or higher and lower than tri-functionality. (See [0086] and [0142]) Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to optimize the weight percent of each epoxy resin since it has been held that, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation. *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). The burden is upon the Applicant to demonstrate that the claimed weight percent of each epoxy resin is critical and has unexpected results. In the present invention, one would have been motivated to optimize the weight percent of each epoxy resin motivated by the desire to tailor the final cured product containing the epoxy resin for end use such as for structural components of airplanes, automobiles and the like. (See Kishi pg. 2, lines 9-14).

Regarding claim 7, Kouchi discloses cured products of epoxy resin compositions designed for production of fiber reinforced composite material (i.e. preregs) to be used

in the aerospace industry are required to have many good properties. (See [0013] and [0052])

14. Claims 22-23 are rejected under 35 U.S.C. 103(a) as being obvious over Ozaki et al. (US 6,027,794) in view Zhou et al. (US 2002/0079052).

Regarding claim 22 Ozaki et al. discloses prepgs, comprising long reinforcing fibers as components [A], a matrix resin as component [B] and long thermoplastic resin fibers as component[C], with the component [C] distributed near either or both of the surface layers without being regularly arranged. (See Abstract) Ozaki et al. the component [C] is made from long fibers of a thermoplastic resin and is distributed at random near the surface layer of the prepreg. The random distribution can also be realized by using a long-fiber nonwoven fabric. (See Col 8, lines 47-49 and 58-59) It is noted by examiner that applicant discloses that the element [C] as claimed means a thermoplastic fabric such as a nonwoven. (See [0064] instant specification) Ozaki et al. discloses the prepgs are used for the preparation of fiber reinforced plastics. (See Col 1, lines 10-15)

Zhou et al. discloses sandwich panels in which the face sheets are self-adhesive so that a separate adhesive film is not required for bonding to the core. (See [0003]) Zhou et al. discloses the self-adhesive prepgs include at least one fiber layer that is impregnated with a prepg resin to form a prepg which has a prepg resin layer having a bonding surface which is bonded directly to the honeycomb during sandwich panel formation.

(See [0011]) Zhou et al. discloses prepreg face sheets which are bonded to a honeycomb core to form sandwich panels that are lightweight, structurally strong and exhibit many other desirable properties. (See [0010])

The art is analogous as set forth above. It is noted by examiner that the combined disclosures of Ozaki et al. and Zhou et al. would readily exhibit all the limitations as claimed by applicant. Specifically, Ozaki et al. discloses elements [A], [C], and [D] as set forth above. It is noted that the matrix resin of Ozaki is a cured matrix resin. (See Ozaki Col 3, lines 60-61) While Ozaki et al. is not explicit as to the final uses of the fiber reinforced plastics comprising the disclosed prepreg, Zhou et al. discloses component [E] for making sandwich panels and other related structural composite materials. (See Zhou [0010])

Regarding claim 23, as the structures of the combined references have been shown to be substantially similar to that as claimed by applicant and comprising all claimed elements, it is noted that the property of a climbing drum peel strength of 33 N•m/m or higher would have been readily provided for by the laminated material.

15. Claims 24 are rejected under 35 U.S.C. 103(a) as being obvious over Ozaki et al. (US 6,027,794) in view of Kishi et al. (EP 0559437) and further in view of Sugimori et al. (US 6,670,006).

Regarding claim 24 Ozaki et al. discloses prepgs, comprising long reinforcing fibers as components [A], a matrix resin as component [B] and long thermoplastic resin fibers as component[C], with the component [C] distributed near either or both of the surface layers without being regularly arranged. (See Abstract) Ozaki et al. the component [C] is made from long fibers of a thermoplastic resin and is distributed at random near the surface layer of the prepg. The random distribution can also be realized by using a long-fiber nonwoven fabric. (See Col 8, lines 47-49 and 58-59) It is noted by examiner that applicant discloses that the element [C] as claimed means a thermoplastic fabric such as a nonwoven. (See instant specification [0063]) Therefore, examiner equates the component [C] of Ozaki et al. with the element [C] of applicant. The prepgs are used for the preparation of fiber reinforced plastics. (See Col 1, lines 10-15) Ozaki et al. discloses the prepgs are used for the preparation of fiber reinforced plastic composite material. (See Col 1, lines 10-20) Ozaki et al. discloses layers of the prepg are laminated and cured to obtain a composite material. (See Col 5, lines 49-51) Ozaki et al. discloses all of the claim limitations as set forth above but the reference does not specifically disclose an epoxy resin comprising epoxy resins (a) and epoxy resin(b) as defined by applicant.

Kishi discloses a prepg suitable for preparing honeycomb sandwich panels. (See Abstract) Kishi et al. discloses a resin composition including an epoxy resin, a curing agent and a rubber (preferably solid). (See pg. 3, lines 16-17) Kishi et al. discloses the epoxy resin may be a mixture of two or more epoxy resins. (See pg. 4, lines 6-8) Kishi et

al. discloses an aromatic diamine may be used as the curing agent. (See pg. 4, lines 25-26) Kishi et al. discloses acrylonitrile-butadiene is the preferred rubber and may be 3-12 parts by weight in 100 parts by weight of the matrix resin composition. (See pg. 4, lines 48-51 and pg. 5, lines 20-23) Kishi et al. discloses the resin composition is used for a cured composite. (See Abstract)

As Ozaki et al. and Kishi et al. are both directed to prepgs the art is analogous. Therefore, one of ordinary skill in the art would have been easily motivated by expected success to utilize the mixture of two epoxy resins as taught by Kishi et al. in place of the epoxy resin as disclosed by Ozaki et al. for the added benefit of tailoring heat resistance, water resistance and processibility. (See pg. 4, lines 5-10) Ozaki and Kishi et al. discloses all of the claim limitations as set forth above, but the reference is silent as to an epoxy resin having oxazolidone rings and a glass transition temperature of 160 to 220°C after heat curing at 180°C for 2 hours.

Sugimori et al. discloses an epoxy resin composition comprising an epoxy resin having oxazolidone rings (component B), and a curing agent (component C). (See Abstract) Sugimori et al. discloses the epoxy resin having oxazolidone rings is essential for high crushing strength. (See Col 4, lines 12-14) Sugimori et al. discloses the curing agent may be an amine compound. (See Col 5, lines 27-30) Sugimori et al. further discloses the composition may contain a component E selected from a glycidylamine-type resin.

As Kishi et al. and Sugimori et al. are both directed to curable epoxy resins, the art is analogous. Therefore, it would have been obvious to one of ordinary skill in the art motivated by expected success to utilize the epoxy resin having oxazolidone rings as taught by Sugimori in the composition as disclosed by Kishi et al. since the Kishi reference discloses that a mixture of two or more epoxy resins may be used. It is noted by examiner that the composition of Sugimori et al. would have been well known in the art at the time of applicant's invention and therefore one of ordinary skill in the art would have been easily motivated to improve the crushing strength of the final resin for end use by utilizing an additional epoxy resin having oxazolidone rings. (See Col 4, lines 12-14)

As the composition of modified Ozaki et al. has been shown to be substantially similar in component make-up as that claimed by applicant, one of ordinary skill in the art would expect that the glass transition temperature of 160 to 220°C after heat curing at 180°C for 2 hours would have been a result effective variable. It is noted that Sugimori contains examples which provide evidence that the components of the composition would affect the glass transition temperature calculated. This is seen in Table 1 for a composition that comprises only components A, B, C, and E versus values calculated in Table 5 for a composition comprising components A, B, C, D, and E. Further, it is noted that one of ordinary skill in the art would have been easily motivated to adjust the time and temperature parameters of the curing conditions. Sugimori discloses curing conditions at 130°C for one hour. (See Col 13, lines 1-2) It would have been obvious to one having ordinary skill in the art at the time the invention was made to create curing parameters for

obtaining a preferred glass transition temperature since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). In the present invention, one would have been motivated to optimize the curing parameters for obtaining a preferred glass transition temperature with the desire to tailor the final cured product containing the epoxy resin for end use such as for structural components of airplanes, automobiles and the like. (See Kishi pg. 2, lines 9-14). Therefore, the claim limitations are met by the combined prior arts.

It should be noted that the recitation of “outer panel” is considered to be an intended use statement and is not given patentable weight at this time since the prior art meets the structural and/or chemical limitations set forth and there is nothing on record to evidence that the prior art product could not function in the desired capacity or that there is some additional implied structure associated with the term. Ozaki et al. discloses all of the claim limitations as set forth above but the reference does not specifically disclose an epoxy resin comprising epoxy resins (a) and epoxy resin (b) as defined by applicant.

Regarding claim 25 as the structures of the Ozaki et al. reference has been shown to be substantially similar to that as claimed by applicant and comprising all claimed elements, it is noted that the property of surface pits with depth of 50 µm or deeper is 2 or less per 10 cm² in the surface would have been readily provided for by the laminated material.

16. Claims 24 and 25 are rejected under 35 U.S.C. 103(a) as being obvious over Ozaki et al. (US 6,027,794) in view of Kouchi et al. (WO 03/040206) and further in view of Kishi et al. (EP 0559437).

This rejection is over WO 03/040206 because the reference qualifies as prior art under 102(b). However, for convenience, the column and line numbers of the English language equivalent and national stage entry, US 2004/0247882, will be cited below.

Regarding claims 26 and 28, Ozaki et al. discloses all of the claim limitations as set forth above, but the reference does not specifically disclose an epoxy resin comprising epoxy resins (a) and epoxy resin (b) as defined by applicant.

Kouchi et al. disclose a liquid epoxy resin composition for low cost production of high performance fiber reinforced composite material. (See [0015]) Kouchi discloses preferred epoxy resins comprise di- or higher functionality such as tetraglycidylaminodiphenyl methane and an epoxy resin having oxazolidone rings. (See [0088]-[0089] and [0111]) Said epoxy resin compositions should, after being cured for two hours at 180°C, preferably have a glass transition temperature of 170°C or more. (See [0040]) Epoxy resin compositions for fiber reinforced composite material to be used in the aerospace industry are required to be small in the decrease in glass transition temperature caused by water absorption, as well as able to form a cured product with a high glass transition temperature. Accordingly, the epoxy resin composition according to the invention should,

after being cured for two hours at 180°C and immersed in boiling water for 48 hours, preferably have a glass transition temperature of 130°C or more. (See [0141]) Kouchi et al. discloses by meeting these requirements, the resulting fiber reinforced composite material comprising a cured product of said epoxy resin composition as a matrix can have a high compressive strength in wet heat. (See [0044])

As Ozaki et al. and Kouchi et al. are both directed to fiber reinforced composite materials, the art is analogous. Therefore, one of ordinary skill in the art would have been easily motivated by expected success to utilize the mixture of two epoxy resins as taught by Kouchi et al. in place of the epoxy resin as disclosed by Ozaki et al. for the added benefit of tailoring the glass transition temperature for the composite material in order to meet aerospace industry requirements. (See [0141]) Kouchi discloses all of the claim limitations as set forth above but does not disclose a solid rubber compound.

Kishi et al. discloses a resin composition including an epoxy resin, a curing agent and a rubber (preferably solid). (See pg. 3, lines 16-17) Kishi et al. discloses the epoxy resin may contain a glycidylamine type epoxy resin such as tetraglycidyl diaminodiphenylmethane. (See pg. 3, lines 53-56) Kishi et al. discloses the epoxy resin may be a mixture of two or more epoxy resins. (See pg. 4, lines 6-8) Kishi et al. discloses an aromatic diamine may be used as the curing agent. (See pg. 4, lines 25-26) Kishi et al. discloses acrylonitrile-butadiene is the preferred rubber and may be 3-12 parts by weight in 100 parts by weight of the matrix resin composition. (See pg. 4, lines 48-51)

and pg. 5, lines 20-23) Kishi et al. discloses the resin composition is used for a cured composite. (See Abstract) Kishi et al. discloses all of the claim limitations as set forth above, but the reference is silent as to the an epoxy resin having oxazolidone rings and an glass transition temperature of 160 to 220°C after heat curing at 180°C for 2 hours.

As Kouchi et al. and Kishi et al. are both directed to curable epoxy resins, the art is analogous. Therefore, it would have been obvious to one of ordinary skill in the art motivated by expected success to utilize the acrylonitrile-butadiene rubber as taught by Kishi et al. in the composition as disclosed by Kouchi et al. for the added benefit of providing high viscosity and high thixotropic properties. (See pg.4, lines 45-46)

Therefore, the claim limitations are met by the combined prior arts.

Regarding claim 25, as the structures of the Ozaki et al. reference has been shown to be substantially similar to that as claimed by applicant and comprising all claimed elements, it is noted that the property of surface pits with depth of 50 µm or deeper is 2 or less per 10 cm² in the surface would have been readily provided for by the laminated material.

17. Claim 27 is rejected under 35 U.S.C. 103(a) as being obvious over Ozaki et al. (US 6,027,794) in view Zhou et al. (US 2002/0079052) as applied to claim 22 and further in view of Kouchi et al. (WO 03/040206) and Kishi et al. (EP 0559437).

This rejection is over WO 03/040206 because the reference qualifies as prior art under 102(b). However, for convenience, the column and line numbers of the English language equivalent and national stage entry, US 2004/0247882, will be cited below.

Regarding claim 27, modified Ozaki et al. discloses all of the claim limitations as set forth above. Zhou et al. further discloses especially preferred are epoxy blends including a mixture of trifunctional epoxy and a difunctional bis-F epoxy. (See [0029]) However, the combined references do not specifically disclose an epoxy resin comprising epoxy resins (a) and epoxy resin (b) as defined by applicant.

Kouchi et al. disclose a liquid epoxy resin composition for low cost production of high performance fiber reinforced composite material. (See [0015]) Kouchi discloses preferred epoxy resins comprise di- or higher functionality such as tetraglycidylaminodiphenyl methane and an epoxy resin having oxazolidone rings. (See [0088]-[0089] and [0111]) Said epoxy resin compositions should, after being cured for two hours at 180°C, preferably have a glass transition temperature of 170°C or more. (See [0040]) Epoxy resin compositions for fiber reinforced composite material to be used in the aerospace industry are required to be small in the decrease in glass transition temperature caused by water absorption, as well as able to form a cured product with a high glass transition temperature. Accordingly, the epoxy resin composition according to the invention should, after being cured for two hours at 180°C and immersed in boiling water for 48 hours, preferably have a glass transition temperature of 130°C or more. (See [0141]) Kouchi et

al. discloses by meeting these requirements, the resulting fiber reinforced composite material comprising a cured product of said epoxy resin composition as a matrix can have a high compressive strength in wet heat. (See [0044])

As modified Ozaki et al. and Kouchi et al. are both directed to fiber reinforced composite materials, the art is analogous. Therefore, one of ordinary skill in the art would have been easily motivated by expected success to utilize the mixture of two epoxy resins as taught by Kouchi et al. in place of the epoxy resin as disclosed by Ozaki et al. for the added benefit of tailoring the glass transition temperature for the composite material in order to meet aerospace industry requirements. (See [0141]) Kouchi discloses all of the claim limitations as set forth above but does not disclose a solid rubber compound.

Kishi et al. discloses a resin composition including an epoxy resin, a curing agent and a rubber (preferably solid). (See pg. 3, lines 16-17) Kishi et al. discloses the epoxy resin may contain a glycidylamine type epoxy resin such as tetraglycidyl diaminodiphenylmethane. (See pg. 3, lines 53-56) Kishi et al. discloses the epoxy resin may be a mixture of two or more epoxy resins. (See pg. 4, lines 6-8) Kishi et al. discloses an aromatic diamine may be used as the curing agent. (See pg. 4, lines 25-26) Kishi et al. discloses acrylonitrile-butadiene is the preferred rubber and may be 3-12 parts by weight in 100 parts by weight of the matrix resin composition. (See pg. 4, lines 48-51 and pg. 5, lines 20-23) Kishi et al. discloses the resin composition is used for a cured composite. (See Abstract) Kishi et al. discloses all of the claim limitations as set forth

above, but the reference is silent as to the an epoxy resin having oxazolidone rings and an glass transition temperature of 160 to 220°C after heat curing at 180°C for 2 hours.

As Kouchi et al. and Kishi et al. are both directed to curable epoxy resins, the art is analogous. Therefore, it would have been obvious to one of ordinary skill in the art motivated by expected success to utilize the acrylonitrile-butadiene rubber as taught by Kishi et al. in the composition as disclosed by Kouchi et al. for the added benefit of providing high viscosity and high thixotropic properties. (See pg.4, lines 45-46)

Therefore, the claim limitations are met by the combined prior arts.

18. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Conclusion

19. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

20. Any inquiry concerning this communication or earlier communications from the examiner should be directed to ALTREV C. SYKES whose telephone number is (571)270-3162. The examiner can normally be reached on Monday-Thursday, 8AM-5PM EST, alt Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Larry Tarazano can be reached on 571-272-1515. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/D. Lawrence Tarazano/
Supervisory Patent Examiner, Art Unit 1794

/ACS/
Examiner
10/22/09